

# A consulting on the management of the murray- darling river report

[Business](#), [Marketing](#)



## **Executive Summary**

The current report presents a number of strategic management strategies to the Australian federal government. In general, the report categorizes different ecosystem services and function provided by Murray-Darling basin into four major categories-production, habitat, information and regulating. Alongside this, the report indicates that in their efforts to provide ecosystem services and functions, industry stakeholders fail to allocate resources efficiently, more importantly, the report indicates that market failures results from nature of the market and the nature of goods and services produced and the nature of exchange used.

The market-based instruments (MBIs) refer to several regulations that government organizations use to regulate the market and encourage desirable behaviors but not through explicit directives. In response, the report recommends for adoption of two MBIs classes-price-based or quantity-based instruments as a way of allowing firms with greater flexibility in management of ecosystem resources.

Finally, the report indicates that federal government can also mitigate on climate changes due to uncertainties and associated risks. To do this, the report recommends on implementing two financial instruments including catastrophe bonds and weather derivatives.

## **Introduction**

The Australian Murray-Darling river basin remains among the world longest rivers. It does not only cover an area of more than 1 million square kilometers, but due to its interconnectivity with other Australian tributaries,

the river ranks fifteenth in the world in terms of its length. Thus like other river systems, it comprises of naturally interconnected biological, chemical and physical elements that all revolves around its water flow. This makes it serve significant role in Australian agricultural system alongside continued provision of ecosystem services and support for biodiversity. Such interconnected role and a further limit in the available water, implies that continued flow and arising needs from the ecosystem along its basin, cannot be met without necessarily compromising with the needs that arise from different points (Norris et al., 2012). Furthermore, Norris et al. also notes that continued changes in land use, extraction of water, continues to exert more pressure on its natural resources. This leads into a significant concern for the entire water quality and ecosystem health status.

In response, the Australia water management agency together with the federal government, have recognized difficulties facing Murray-Darling basin system. The current report provides consulting services to the federal government and management agencies. The report accomplishes this by presenting and dealing with five major tasks. (1) It makes a category of four examples of key ecosystem services that Murray-Darling basin provides in Australia. (2) It discusses the reasons as to why the system cannot provide efficiency to the ecosystem services in case of no regulations. (3) Provide 2-3 examples of market-based instruments (MBIs) that improve the above ecosystem services. (4) Potential effect of climate changes on ecosystem services. (5) Financial instruments that help the federal government to manage the environment risks identified above.

## **Ecosystem Services**

Acreman and Maltby (2011) the ecosystem services include services and functions that support life on earth. In their illustration, Acreman and Maltby states that life in this context does not only limit itself to people, but also refers to fauna and flora. While there are several economic services, there are those that are more relevant to supporting life than others are. In 1997, the Daily listed a minimum of 13 ecosystem services as the critical functions and services to support life on the earth. In a similar capacity, Costanza et al., (1997) also provided a similar list but with a higher number of ecosystem function and services forming 17 minimum as life supporting.

Therefore, compiling all these functions and services indicated by Daily (1997), Costanza et al. (1997) and the one provided by De Groot et al (2002) Kaval (2010) came up with an entire updated list of ecosystem functions and services that Murray-Darling basin provides to Australian and other countries. All these functions are necessary in supporting and sustaining life on earth.

Similar to the four grouping fashion assessment conducted by Millennium Ecosystem, De Groot et al. (2002) on the other hand, divided the entire ecosystem services into four major categories-information, production, habitat and regulation services. Consequently, Kaval (2002) categorized his ecosystem functions and services into similar categories just as provide by De Groot et al. (2002).

The report uses above description to compile a list from Daily (1997) and Costanza et al. (1997). This results into twenty-two ecosystem service functions that equally apply to Murray-Darling basin in Australia. The report

presents four major categories of ecosystem services of Murray-Darling basin to the federal government. This is to provide a clear understanding on how to management the entire Murray-Darling basin. According to figure 1 below, the four categories of ecosystem services includes production, regulation, information and habitat function.

Figure 1: Murray-Darling basin Ecosystem services

### **Source: Author generated from Murray-Darling service functions**

The above four categories indicate that the federal government need to specifically deal with each category that affect the Australian economic system and life.

Murray-Darling basin provides three major production services-raw materials, production of food, medicinal and generic resources. Just like in any economy, sustenance of industries depends on natural resources as raw materials. For example, industries extract water from the river basin for industrial use, sand as the building material and timber as raw materials for construction, paper processing among others. In addition, Australian economy also boasts because of large amount of food produced by Murray-Darling basin. According to Norris et al., (2012), Murray-Darling basin covers more than 40 percent Australian farms. In general, the Australian farms under Murray-Darling basin produces cotton, sheep, vegetables, fruits, rice, cattle, oil-seed, wheat and wool all produced for domestic and export markets. Because Australian economy remains an important agricultural country, Murray-Darling basin supports the production of more than one third of economy's food supply and a further support to more than third of

country's total gross agricultural value by production. In addition, Australian Government (2011) records that Murray-Darling supports more than 4.2 percent (300,000) workforce employed in Agricultural sector.

The fact that the water source continues to support and act as the production mechanism, Markham (2012) in his journal article, analyzed the capacity of water needed by agricultural sector. For example, Markham found that in order to produce one kilogram of dry wheat grains, one requires more than 750 litres of water, one kilogram of maize requires more than 540 litres of water, one clean wool, it requires more than 170,000 liters of water and one kilogram of soybeans, it requires more than 2200 liters of water among others. The figures mean that the Australian government need to respond appropriately in conservation of Murray-Darling basin water and its tributaries.

## **Market failures**

Market failures according to Morey (2012), is one of the concept in economic theory that describes a situation when the free market fails to allocate both goods and services efficiently. In his illustration, Morey indicates that the outcome process fails to become Pareto optimal. While some people become better off by gaining from resource allocation, there are those who get worse off. In general, Morey indicates that market failures in any economic system, associates itself with aspects such as problems with the principle-agents, public goods, externalities, non-competitive markets and information asymmetries. In relation to Murray-Darling basin, market failures for regulation of services that arises from the ecosystem, justifies the need for

Australian federal government to undertake on management interventions. However, the government may also become one of the sources for the market failure. According to Pittock and Finlayson (2011) is that instead of above factors contributing to market failures, the government may use some of its policy interventions such as regulations and price controls to correct the market.

Different economists have come up with different events and sources that cause market failures. In essence, the mainstream economists content that market failures may occur due to three major reasons- small group of people gains power over the market, the entire market sector becomes monopolized and if the production of goods and services, and in this case, if the Murray-Darling ecosystem services become externality or public. All these come down to three specific reasons including nature of the market and the nature of goods and services produced and the nature of exchange used.

Australian Government (2011) report indicates that Australia has only four fishing companies that depend on Murray-Darling basin. This includes Clean seas Tuna Ltd, Tassai group Ltd, Cervantes corporations Ltd and Australian Fishing Enterprises Pty Ltd. Apart from this, the Australian government also contains both small and large-scale farmers that depend on Murray-Darling basin to conduct their farming. However, Australian Government statistics indicates that the number of small-scale farmers that depend on the basin, has continued to decline as majority of them turn to large-scale farming. For example, Australian Government Indicates that as at 2012, there were less than 150, 000 farmers in Australia. From this number, more than half comprised of mixed farmers for mixed crops and livestock farmers (23%),

dairy farmers (7%), and cattle farmers (21%) among other farmers. This number has continued to decrease for a number of decades as small scale farmers turn to large-scale farming operations and other young people who turn to family farming.

According to the above statistics, it implies that the Australia market experienced fewer number of ecosystem service suppliers for categories including in production, regulation, habitat and information categories. This presents that nature of the market to have few suppliers who gain control and power over the market. According to Collins, Bueren and Whitten (2012), few suppliers that act as the agents in the market, gain power that makes such suppliers to block the mutual benefits thus resulting into inefficiency as a source of imperfect competition. It is because of imperfect competition that makes Australia to experience monopolistic competition. For example, the few suppliers in the four categories restrict output below certain quantities in order to charge high market prices alongside aims of benefiting from higher profits.

Furthermore, climate change also causes market failures along Murray-Darling basin. The report recommends the federal government to implement on three elements of policies for an effective response. In response to climatic change, the government need to price on carbon by taxing carbon-producing companies, regulate on the products and services produced. Secondly, the federal government needs to implement on innovations that support deployment of low carbons and innovations. The third policy includes the federal government implementing on policies that eliminates barriers to



market entry. This will facilitate formation of other companies to participate in offering ecosystem services in the four categories.

## **Market-based instruments (MBIs)**

The market-based instruments (MBIs) refer to several regulations that government organizations use to regulate the market and encourage desirable behaviors but not through explicit directives (Whitten & Coggan, 2005; Collins et al. 2012). Furthermore, Collins et al. (2012) also describes such instruments as regulations that helps to harness the market forces due to their potential of being able to redefine organization and individual agenda and attain beneficial outcomes. In essence, therefore, the MBIs help to achieve a desirable outcome that provides self-interest both to the firms and individuals. Apart from adopting on MBIs to achieve on policy targets at a lower cost, Collins et al. notes that there are other interests that targets firm risks.

According to figure 2 below, Collins et al. states that Australia categorizes its MBIs into two classes-price-based or quantity-based instruments. Apart from the two, Collins et al. also indicates that government implement on instruments that improves the general operation of entire markets. Collins et al. refers to such instruments as market-friction instruments.

Source: Collins et al. (2012): An Overview of Market-Based Instruments and Environmental Policy in Australia

## **Price-based instruments**

The instruments assign a specific price on any impact caused to environment. To do this, the Australian government need to impose a

charge, subsidies or tax firms that deal with provision of ecosystem services identified in the four categories. In their response, this will make firms to adopt efficient resource use and manage practices that provide them with greater gains. In case such a policy becomes effective, then firms through their management will improve on management of ecosystem resources from Murray-Darling basin.

## **Quantity-based Instruments**

Quantity based is also termed as market creation instruments, creates the market in the right direction with an aim of engaging in activities that identify resources or environmental damage. The Australian government needs to restrict firms in extracting more water from Murray-Darling basin, overfishing, farming along the riverbank among others. In addition, the federal government can also give rights for firms to participate in ecosystem conservation activities. This may include planting more trees and refilling the basin with more water.

## **Other market-based Instruments**

Relatively, the two MBIs work better than other policy instruments such as command and control direct instruments. In essence Whitten and Coggan (2005) states that Command and control policies are more prescriptive in nature. They less restrict technology that limiting firms efforts to participate in innovation. They are prescriptive in nature in that, they demand firms to disclose information, firms to use specific technology and all firms to emit same amount of gases. However, price and quantity based allows firms with greater flexibility in management of ecosystem resources.

## **Risks of climate change to ecosystem services**

Sustainability and future certainty of Murray-Darling system require stable climate and policy measures. However, the authority identified that because of frequent climate changes, this becomes the major source for uncertainty and risks for the system sustainability. According to Markham (2012), the major potential effects caused by climate changes, includes loss of biodiversity, reduction in water volume, increased risk of storms and fire, rapid warming and aridity and changes in the rainfall patterns. All these would have an overall negative impact to the four ecosystem service categories.

## **Financial instruments as management strategy**

Climate changes and future risks are major reasons as to why government and other agencies implement on financial instruments such as catastrophe bonds and weather derivatives. Rademaekers et al. (2011) indicates that such financial instruments offers management strategies that reduces on possible environmental risks from climate changes.

## **Catastrophe bonds**

Also referred to as CAT bonds, they offer solution to timely mitigation in case of a severe event. For example, a climate change may cause a storm causing Murray-Darling basin to break its banks. As a way of federal government implementing on this instrument, it allows the insurance to pay the investor and deal with effects of storm. The bonds enable the government and investors to prioritize their responses instead of focusing on prevention mechanisms. Secondly, the bonds form part of insurance securitization. This

makes it easier to transfer the risk from issuers to investors. Thirdly, the bonds have become more competitive at the time of their pricing in relation to ordinary bonds. Catastrophe bonds can also provide opportunities to fixed income managers by gaining from the yield pickup. Lastly, the bonds provide opportunity diversification.

However, part of the financial instrument, such instruments are only available to institutional investors. In addition, the bonds suffer more from the lower liquidity rate than the normal market bonds. Recent growth of environment catastrophes from climate changes, forces insurers to model other insurance related businesses thus undermining future growth in catastrophe bonds.

## **Weather derivatives**

They are part of financial instruments used by either individuals or firms as strategies to manage their risks. Due to climate changes, the Australian federal government needs to implement on the instrument to reduce potential risks associated with both unexpected and adverse conditions. As an advantage to Australian Murray-Darling basin, the federal government needs to implement the strategy in order to hedge farmers against poor harvest due to excess rain, temperature variability and high winds. Secondly, they cover on high probability events and low-risks.

However, also other disadvantages face implementation of weather derivatives as mitigation strategies to climate changes. In general, businesses face different and unique risks. In essence, climate changes seem to affect both usage and volume more than they do on prices. Secondly,

weather associated risks are unique and localized. Despite advances in technology and science, Rademaekers et al., (2011) notes that governments have failed to predict accurately and timely on climate changes.

## **Conclusion**

Following the above report, Murray-Darling basin continues to suffer from the increased extraction of water, human land use, and increased pressure on the natural resources, constant decline in the water quality and health status. Despite this, the basin offers four categories of ecosystem services including production, information, regulation and habitat. In response, the report in the foregoing sections recommends several management strategies. Among these, the report provides for the federal government to two MBIs-price and quantity based instruments as a way of dealing with market failures. In addition, the climate change also indicates the federal government to implement on two financial instruments- catastrophe bonds and weather derivatives.

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